Claims

1. A method of producing an m x N sheet of optical fibers, comprising:

co-extruding a core material and a cladding material through a co-extrusion die, wherein an m x N array of optical fibers is extruded each having a portion of the extruded core material surrounded by a portion of the cladding material, and wherein m << N;

merging adjacent optical fibers together after the m x N array of optical fibers exit the co-extrusion die to form an m x N sheet of optical fibers; and

cooling the m x N sheet of optical fibers so as to solidify the m x N sheet of optical fibers.

2. The method according to claim 1, wherein cooling the m x N sheet of optical fibers comprises taking up the m x N sheet of optical fibers on a cooling wheel after merging adjacent optical fibers together.

3. The method according to claim 1, further comprising:

drawing down the m x N sheet of optical fibers before cooling the m x N sheet of optical fiber.

4. The method according to claim 3, wherein drawing down the m x N sheet comprises rotating the cooling wheel at a rate which causes the m x N sheet of optical fibers to be taken up by the cooling wheel faster than the rate of extrusion from the co-extrusion die such that the m x N sheet is drawn down.

5. The method according to claim 4, wherein the m x N sheet of optical fibers is taken up at least ten times faster than the rate of extrusion from the co-extrusion die.

6. The method according to claim 3, wherein after drawing down the m x N sheet of optical fibers, the m x N sheet of optical fibers has a desired cross-sectional shape.

7. The method according to claim 3, wherein after drawing down the m x N sheet of optical fibers, the optical fibers have a desired index of refraction profile.

8. The method according to claim 1, further comprising:

co-extruding a sea material through the co-extrusion die, wherein the m x N array of optical fibers is extruded each having the portion of the extruded core surrounded by the portion of the cladding material, further surrounded by a portion of the sea material, wherein the sea material is strongly light absorbing.

9. The method according to claim 1, further comprising:

co-extruding a sea material through the co-extrusion die, wherein the m x N array of optical fibers is extruded each having the portion of the extruded core surrounded by the portion of the cladding material, further having a portion of the sea material on at least a portion of an outer boundary of the cladding material such that after merging adjacent optical fibers together to form an m x N sheet of optical fibers the sea material is on at least one surface of the m x N sheet.

10. The method according to claim 8, wherein the sea material is positioned between adjacent optical fibers in a first direction and not between adjacent optical fibers in a second direction.

11. The method according to claim 1, wherein $1 \leq m \leq 4$.

12. The method according to claim 11, wherein $N \geq 100$.

13. The method according to claim 4, wherein the m x N sheet of optical fibers is taken up at least about 1.5 to about 30 times faster than the rate of extrusion from the co-extrusion die.

14. The method according to claim 1, wherein the optical fibers have diameters in the range of about 2 microns to about 2,000 microns.

15. The method according to claim 1, wherein the core material comprises one or more materials selected from the group consisting of polystyrene, polymethyl methacrylate, polybenzyl methacrylate, polycarbonate, copolymers thereof, and other compounds copolymerizable therewith.

16. The method according to claim 1, wherein the cladding material comprises one or more materials selected from the group consisting of: polyethyl methacrylate, poly-2, 2, 2-trifluoroethyl methacrylate, polyvinyl acetate, copolymers thereof, and other compounds copolymerizable therewith.

17. The method according to claim 1, wherein the optical fibers' refractive indices change discontinuously at the core-cladding boundary.

18. The method according to claim 1, wherein the optical fibers' refractive indices change over a finite distance near the core-cladding boundary thereby varying in a continuous manner at the core-cladding boundary.

19. An m x N sheet of optical fibers produced in accordance with the method of claim 1.

20. An m x N sheet of optical fibers produced in accordance with the method of claim 13.

21. A method for producing a block of optical fibers, comprising:

layering a plurality of m x N sheets of optical fibers, wherein m << N;

causing the plurality of m x N sheets of optical fibers to form a block of optical fibers.

22. The method of claim 21, wherein causing the plurality of m x N sheets to form a block of optical fibers comprises heating the plurality of m x N sheets above the glass transition temperature of the m x N sheets' material while applying pressure to the plurality of m x N sheets such that the m x N sheets fuse with each other.

23. The method according to claim 22, wherein heating comprises heating the plurality of m x N sheets to a temperature in the range of about 20°C above the glass transition temperature to about 60°C above the glass transition temperature of the m x N sheet material.

24. The method according to claim 22, further comprising:

drying the plurality of m x N sheets after layering.

25. The method according to claim 24, wherein drying comprises heating the plurality of m x N sheets to a temperature below the glass transition temperature of the m x N sheets' material.

26. The method according to claim 25, wherein drying comprises heating the plurality of m x N sheets to a temperature in the range of about 20°C below the glass transition temperature to about 50°C below the glass transition temperature of the m x N sheets' material.

27. The method according to claim 21, wherein causing the plurality of m x N sheets of optical fibers to form a block of optical fibers comprises applying an adhesive between adjacent m x N sheets of optical fibers.

28. The method according to claim 27, wherein the adhesive is set via a mechanism selected from the group consisting of: heat, ultraviolet radiation, oxygen activation, and pressure.

29. The method according to claim 28, wherein pressure is exerted on the plurality of m x N sheets prior to setting the adhesive to remove air and water vapor from between the m x N sheets of optical fibers.

30. The method according to claim 21, wherein $1 \leq m \leq 4$.

31. The method according to claim 30, wherein $n \geq 100$.

32. The method according to claim 30, wherein $n \geq 1000$.

33. The method according to claim 21, wherein layering a plurality of m x N sheets of optical fibers comprises:

winding a continuous m x N sheet of optical fibers onto a fixture such that the continuous m x N sheet of optical fibers layers upon itself as the continuous m x N sheet is wound onto the fixture; and cutting through the layers of the continuous m x N sheet wound onto the fixture in at least two locations such a layered plurality of m x N sheets of optical fibers is achieved.

34. The method according to claim 33, wherein the fixture has a means for guiding the continuous m x N sheet onto the fixture such that each layer of the continuous m x N sheet is aligned with the previous layer of the continuous m x N sheet as the continuous m x N sheet is wound onto the fixture.

35. The method according to claim 33, wherein pressure is applied to the layers of the continuous m x N sheet wound onto the fixture during to cutting.

36. The method according to claim 35, wherein the means for guiding the continuous m x N sheet onto the fixture comprises two guides between which the continuous m x N sheet is guided, wherein pressure applied during cutting is applied via a cover plate which is positioned between the two guides and on top of the wound continuous m x N sheet.

37. The method according to claim 36, wherein a distance separating the two guides between which the continuous m x N sheet is guided is maintained essentially equal to the width of the continuous m x N sheet and the width of the continuous m x N sheet is maintained at essentially a constant value during winding.

38. The method of claim 21, wherein the m x N sheets of optical fibers are produced by the method of claim 1.

39. The method of claim 37, wherein the m x N sheets of optical fibers are produced by the method of claim 13.

40. A block of optical fibers produced in accordance with the method of claim 39.

41. A display, comprising:

a plurality of display tiles, each having a light-emissive display area surrounded by a non-light emissive border wherein at least two of the plurality of display tiles are positioned adjacent each other such that the borders of adjacent tiles are adjacent each other and create a non-light emissive seam between the adjacent tiles; and a corresponding plurality of polymeric fiber optic image transmission devices, a first end of each image transmission device coupled to the display area of the corresponding display tile, and a second end of each image transmission device being in lateral contact with a

second end of the image transmission devices corresponding to display tiles adjacent its corresponding display tile,

wherein the image transmission devices each comprise an array of optical fibers, each optical fiber having a first end at the first end of the image transmission device and a second end at the second end of the image transmission device, wherein each of the plurality of image transmission devices conveys an image received by its first end from its corresponding display tile to its second end such that the second ends of the plurality of image transmission devices act as a single secondary display panel, wherein the size of the seam between the second ends of adjacent image transmission devices is smaller than the seam between the corresponding adjacent display tiles.

42. The display according to claim 41, wherein the seam between the second ends of adjacent image transmission devices is essentially imperceptible.

43. The display according to claim 41, wherein the image transmission devices are produced from a block of optical fibers produced by the method of claim 21.

44. The display according to claim 41, wherein the image transmission devices are produced from a block of optical fibers produced by the method of claim 39.

45. The display according to claim 41, further comprising a light diffuser sheet optically coupled to the single secondary display panel.